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Document Title GLAST LAT Calorimeter Crystal Handling and Shipping Procedure		

GLAST LAT

Calorimeter Crystal Handling and Shipping Procedure

DOCUMENT APPROVAL

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CHANGE HISTORY LOG

Revision	Effective Date	Description of Changes	DCN #
1		Initial Release	

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1.0 SCOPE

This document describes the requirements for handling and shipping of Thallium-doped Cesium Iodide, CsI (TI) crystals for the Calorimeter subsystem of the GLAST Large Area Telescope (LAT).

2.0 APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein.

International

Military

MIL-D-3464	Desiccant, Activated, Bagged, Packaging Use and Dehumidification
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LAT Calorimeter Specifications

LAT-DS-00095-03	LAT Calorimeter CsI Crystal Specification
LAT-MD-00228-D2	LAT Calorimeter, Tracker, and Data Acquisition Contamination Control Plan

3.0 REQUIREMENTS

3.1 General

WARNING: Crystals are sensitive to humidity and damp surfaces. Relative humidity should be controlled and shall not exceed 45%. The temperature of the crystals shall never be below the dew point of their environment. Crystals shall never come in contact with a damp surface.

The following care shall be exercised during handling of the crystals. All persons are responsible for adherence to this procedure.

1. All crystals shall be traceable from procurement through receiving, processing, inspection, shipping, and delivery. When personnel action impacts the traceability and identification, all personnel must ensure traceability. Because the crystal itself does not contain a uniquely identifying mark, the shipping wrapper conveys the serial number. The shipping wrapper shall be maintained with the crystal at least until the diode bonding process is complete and documented, at which point traceability is maintained through the flex cable identifier. If a crystal is removed from its wrapper, the supporting or working fixture that holds the crystal shall be labeled with the serial number.
2. It is the responsibility of each worker to ensure that crystals are returned to their respective wraps and boxes after use. Each crystal shall be returned to its wrapper in the proper orientation, with the label on the "top" face – where the crystal is inscribed with a small V – and the characters on the label reading from left to right, where the "right" end is the end inscribed with the small V.
3. CsI crystals are malleable and ductile. The four long edges of the crystals have a chamfer that is critical for assembly. The chamfer can be damaged by forces exerted by hand. It is essential that the crystals be handled in such a way as to prevent damage or deterioration during all phases of

operation. Crystals shall be supported by rigid mechanical structures during handling and transport. These supports shall be made of an aluminum channel covered with soft materials (such as Teflon or nylon).

4. Only powder-free nitrile gloves shall always be used while contacting or handling crystals. Crystals shall never be handled using bare hands.
5. The crystal temperature shall never be below the dew point of the environment surrounding the crystals.
6. RH shall be maintained below 45% . Crystals are not sensitive to ESD. Prior to bonding with DPDs, the RH of the crystal environment shall be maintained as low as practically possible.
7. If the humidity of the environment is beyond 45% for more than 2 hours, any humidifier in the workroom shall be shut down until the RH level is within the specification. If possible, crystals shall be removed to a dry environment. QA shall be informed of this deviation immediately.
8. The crystals shall not be subject to temperature gradients greater than 10C per hour.
9. Continuous temperature and humidity monitoring records for the crystal work areas shall be maintained and shall be made available for review.
10. Sharp objects shall not be used while handling or performing operations on the crystals, except as required and identified in approved procedures.
11. All tools shall be wiped clean with 100% ethyl alcohol prior to contact with the crystals.
12. All materials shall be handled in such a manner as to minimize exposure to humidity, skin oils, and contamination.
13. All materials shall be handled only by personnel wearing approved unpowdered, nitrile gloves.
14. All work surfaces shall be kept free of noticeable dust and debris. Worktables shall be cleansed with 100% ethanol before use and covered with protective film or paper, as appropriate.
15. Where practical, tethered tools shall be used when working above the crystals.
16. Each crystal is received in a sealed and evacuated plastic bag. The bag shall be cut opened at one end with a pair of scissors and carefully slid off the crystal without lifting the crystal from the work place (to minimize the risk of dropping a crystal and the likelihood of scratching the crystal surface).
17. Crystals shall be shipped from Sweden in approved containers. These containers shall have rigid outer surfaces, internal foam to absorb shocks, and rigid support structures for each crystal. If practical, the same containers shall be used to ship completed CDEs from France to the US.
18. The time of exposure of the crystal boxes in its packaging to uncontrolled environments shall be minimized by arranging for immediate pickup or held in an environmentally controlled area.
19. To ensure that knowledge of the temperature and humidity range is preserved, recorders or strip indicators shall be placed inside the shipping containers.
20. A minimum of two triaxial 50-g shock sensors shall be placed directly on the crystal boxes. The shock sensors shall be mounted using double adhesive tape supplied with the sensor, or if the sensor is reused, it may be wrapped with kapton tape or equivalent onto the cell.
21. An additional triaxial 50-g shock sensor shall be mounted on the top exterior of the shipping container to inform the courier that the product inside is very sensitive to shock and that the container shall be handled properly. This exterior sensor shall be well protected to avoid damage from possible rough handling.
22. If, for any reason, the RH and shock recording device records values above the limits, all crystals shall be evaluated for the effect of the time spent out of spec.
23. To prevent temperature shock, the crystal boxes shall be stored for at least 36 hours without being opened.

The outside of the shipping container shall be legibly identified with the following information on a removable label:

- a) Ship to address
- b) Contract and/or sales order number
- c) Part number
- d) Gross weight and box number "as part of" total number of boxes
- e) Special handling instruction for "sensitive delicate parts – shock sensor enclosed" with exterior shock sensor displayed
- f) Point of origin for return address

24. When it is separated from the crystal, the protective Tyvek and aluminum foil wrapping shall be stored in a clean, environmentally controlled container for potential re-use.
25. After any measurements, inspections, or test procedures on the crystal are performed, the crystal shall be rewrapped in its factory Tyvek sleeve and returned to its slot in the shipping tray, or stored.
26. All lifting equipment shall be tagged with rated capacity, proof load and date.
27. All lifting equipment shall be inspected for proper configuration, damage, and proof load / rating tags prior to lift.
28. All work shall be performed by certified operators.
29. During lifting crystals, the immediate area shall be cleared of non-essential personnel and barricaded.
30. Individual boxes containing crystals in the box weighing 30 lbs or less may be handled manually or with the aid of a mechanical lifting device. However, crystal boxes weighing greater than 30 lbs shall always be lifted with a mechanical lifting device and with at least two personnel carrying out the task. The responsible engineer or his designee shall monitor the unpacking operation.

3.2 Facilities

Facilities where crystals are received, checked, and stored shall meet the class 100,000 clean room requirements as per LAT-MD-00228-D2, contamination control plan. The temperature and humidity shall be controlled as defined herein. The area shall be a limited access area where good housekeeping procedures are followed i.e., the areas will be cleaned at frequent intervals, all personnel must wear clean room smocks. No smoking, eating or drinking shall be permitted. All personnel handling crystals shall be trained the requirements specified in LAT-MD-00228, contamination control plan. The area shall be equipped with a continuous monitoring temperature and humidity. The area shall have an alarm system (i.e. bells or flashing lights or equivalent) that will be activated if the temperature and/or RH reach below or above the set point respectively.